Migration Guide

Differences Between GR64 and GR4x Wireless CPU® Devices

Reference: **WI_DEV_GR64_DVD_001**

Version: **002**

Date: **April 18, 2007**

wavecom

Make it wireless

Operating Systems | Integrated Development Environments | Plug-Ins | Wireless CPUs | Services

Trademarks

®, WAVECOM®, WISMO®, Open AT®, Wireless CPU®, Wireless Microprocessor® and certain other trademarks and logos appearing on this document, are filed or registered trademarks of Wavecom S.A. in France or in other countries. All other company and/or product names mentioned may be filed or registered trademarks of their respective owners.

Copyright

This manual is copyrighted by WAVECOM with all rights reserved. No part of this manual may be reproduced in any form without the prior written permission of WAVECOM.

No patent liability is assumed with respect to the use of the information contained herein.

No Warranty

This document is provided “as is” without any warranty of any kind. WAVECOM makes no warranties of any kind, either express or implied, including any implied warranties of merchantability, fitness for a particular purpose or noninfringement.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

Revision History

Edition	Date	Change Information
001	04/04/2007	First Edition
002	04/18/2007	Added warning to Section 4.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

Table of Contents

1 Target Users 1

1.1 MIGRATION AIM 1

1.2 MIGRATION STRATEGY 1

1.3 MIGRATION VALUE 1

2 Product Differences 2

2.1 GR64 VARIANTS 2
2.1.1 INTEGRATED SIM VARIANT 2
2.1.2 LEGACY VARIANT 2

2.2 NOTEWORTHY DIFFERENCES 3
2.2.1 GSM FREQUENCY COVERAGE 3
2.2.2 GPRS OPERATING CLASS 3
2.2.3 UARTS 5
2.2.4 DIGITAL IO 5
2.2.5 PCM AUDIO 6
2.2.6 SIM INTERFACE 9
2.2.7 DAC INTERFACE 9
2.2.8 ADC INTERFACE 9
2.2.9 SPI 9
2.2.10 SLEEP MODE 9
2.2.11 MECHANICAL FORM FACTOR 10

2.3 GENERAL OBSERVATIONS 10

3 Product Comparison 11

3.1 GR64 SIGNAL INTERFACE 11

3.2 SPECIFIC SIGNAL DIFFERENCES 14
3.2.1 SIGNAL FUNCTIONALITY 14
3.2.2 CHARGING INPUT 17
3.2.3 SIM VOLTAGE 17
3.2.4 D TO A CONVERTER 17
3.2.5 REAL TIME CLOCK VOLTAGE 18
3.2.6 A TO D CONVERTER 18
3.2.7 REGULATED VOLTAGE REFERENCE 18

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

3.2.8 FORMER UART2 19
3.2.9 FORMER PCM AUDIO DIGITAL CODEC INTERFACE 19
3.2.10 ALARM 20
3.2.11 SERVICE SIGNAL 20

3.3 GENERAL SIGNAL DIFFERENCES 21
3.3.1 AUDIO INTERFACES 21
3.3.2 MULTIPLEXED SIGNAL FUNCTIONS 22

3.4 SOFTWARE COMPATIBILITY 22
3.4.1 SIGNAL BEHAVIOUR 23
3.4.2 AT COMMANDS 23

4 Mechanical Comparisons 26

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

1 Target Users

The GR64 wireless modems are designed to be integrated into machine-to-machine or man-to-machine communications applications.

They are intended to be used by manufacturers, system integrators, applications developers and developers of wireless communications equipment.

The GR64 is design to be functionally comparable to an earlier series of M2M telemetry products; the GM4x series and the GR4x series. These users are the primary focus of the GR64.

1.1 Migration Aim

This document identifies a suitable migration to the GR64 for existing users of the following Wavecom M2M devices:

- GM47
- GR47
- GM48
- GR48

1.2 Migration Strategy

The Wavecom Gx64 series devices provide a family of products based on a Quad Band GPRS Core concept. The GR64 shares a large degree of commonality with the GS64, with the exception that its mechanical form-factor, physical interface, and signal characteristics are designed to be closely aligned to the existing products listed above, thereby providing a convenient path for upgrade.

Some differences do exist between the existing GM/GR4x products and the new GR64. This Migration Guide highlights the differences and identifies ways to minimize any effects on existing users.

1.3 Migration Value

The GR64 was developed for a number of key reasons, all of them designed to benefit existing users of the predecessor family:

- Newer technology
- ROHS compliance
- Better performance

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

2 Product Differences

This section identifies the major differences between GR64 and the predecessor GR47/48 products. For all practical purposes the comparisons also reflect the similarities and differences to the GM47/48 since these products are merely a subset function of the GR products.

2.1 GR64 Variants

The GR64 is available in a number of variants. The major variance is described below, and a table is included as a quick-guide reference.

2.1.1 Integrated SIM Variant

The integrated SIM variant GR64 has, as the name suggests, a physical SIM holder mounted on the top side of the assembly. Like its predecessor it supports a SIM card connected through the system connector (off-board). This version of the GR64 also has a Real Time Clock (RTC) alarm output. Digital PCM connectivity is different to that of legacy products. Level shifting circuitry is incorporated in the Wireless CPU®, allowing the host to provide its own I/O reference.

Additionally, the integrated SIM variant is available with or without Embedded Applications capability.

2.1.2 Legacy Variant

The legacy variant GR64 relies on an off-board SIM connection, accessible through the system connector. The legacy variant does not support the RTC alarm, but does allow legacy applications to retain digital PCM audio routing without making changes to their application PCB. Level shifting circuitry is incorporated in the Wireless CPU® providing instant compatibility with 2.8V/3.0V legacy technology, or allowing the host to use a Wireless CPU®-originated I/O reference to level shift its application I/O.

Additionally, the integrated SIM variant is available with or without Embedded Applications capability.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

GR64 Variants Quick Guide

GR64 Product	GR64001	GR64002
Integrated SIM holder	NO	YES
RTC Alarm interface	NO	YES
Direct 2.8V/3.0V I/O compatible	YES	NO
On board level shifting support	YES	YES
Embedded Application support	YES	YES

2.2 Noteworthy Differences

Some essential differences exist between the respective products, which are summarized here and described in further detail in subsequent sections of this document.

2.2.1 GSM Frequency Coverage

The GR64 is a Quad Band product, unlike its predecessors which were dual band. The GR64 provides seamless GSM coverage in all regions of the world, in the following GSM bands:

- GSM 850
- E-GSM 900
- GSM 1800
- GSM 1900

2.2.2 GPRS Operating Class

The GR64 is a GPRS Class 10 capable device, compared with its predecessors which were Class 8. GPRS Class marking defines the number of uplink and downlink slots that are permissible, as the following tables show:

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

GPRS Multislot Class Support

Multislot Class	Downlink Slots	Uplink Slots	Active Slots	Product Capability		
				GR47	GR48	GR64
8	4	1	5	Yes	Yes	Yes
10	4	2	5	No	No	Yes
12	4	4	5	No	No	No

Multislot Class Performance – all configurations

Multislot Class	Downlink Slots	Uplink Slots	Maximum Data Rate	
			Receive	Send
8	4	1	32-40Kbps	8-12Kbps
10	4	1	32-48Kbps	8-12Kbps
	3	2	24-36Kbps	16-24Kbps
12	4	1	32-48Kbps	8-12Kbps
	3	2	24-36Kbps	16-24Kbps
	2	3	16-24Kbps	24-36Kbps
	1	4	8-12Kbps	32-48Kbps

Actual data rates achieved are dependent upon the Coding Scheme (CS) in use; the table above shows the range of rates that are achievable within the CS classes supported by the GR64.

The major impact of GPRS Class differences between the GR64 and legacy products is the demand upon power supplies to maintain peak currents during the increased number of transmission bursts within a single GSM timeslot. The major impact is in the lower GSM bands (GSM850/900) where maximum transmitter output power is 2W (33dBm). In order to support more than two bursts within a GSM timeframe it may be necessary for integrators to review their power supply designs in order to make full use of the added uplink slot capability of GR64.

To overcome the problem that multiple uplink allocation may present to legacy applications, the following measure has been taken: users have the capability to modify the GPRS operating class reported to the network in the initial release of products, thereby avoiding the potential for being allocated additional uplink slots.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

2.2.3 UARTs

The GR64 has only two UART interfaces, unlike its predecessors which had three. For legacy reasons the signal nomenclature has been retained, so that the original UART1 and UART3 still exist.

UART2 has been replaced by a reserved, peripheral interface.

2.2.4 Digital IO

The GM/GR4x series operated 2.78V digital IO. The newer technology of the GR64 utilizes 1.8V logic. To overcome interface difficulties with legacy applications, the GR64 has level shifters on each of the IO interfaces.

The legacy variant GR64 references an internal 2.8V regulator, performing the necessary bi-directional level translation. Some modification to existing user interface circuitry may be necessary due to the internal impedance of the level shifters themselves; this is detailed in a subsequent section.

The integrated SIM variant GR64 employs the same level shifters, and provides a VREF input signal so that users can provide an application-side digital IO reference voltage to the GR64 Wireless CPU®.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

2.2.5 PCM Audio

The GM/GR4x series implemented a PCM (digital) audio feature which permitted the user to access the interface between the audio Codec and the DSP, which also allowed additional DSP devices to be wired at this junction.

The GR64 baseband architecture does not lend itself to the same physical interface as the predecessor hardware, since the digital audio is memory mapped to a parallel data bus. However, the echo cancellation capability of GR64 is a vast improvement on the predecessor series, and simply does not present the same challenges.

The legacy variant GR64 will allow legacy application PCBs, wired so that the respective PCM uplink and downlink paths are connected, to remain unchanged. However, any external circuitry connected to these pins will not function. Instead, the advanced echo and noise canceling properties of the GR64 will compensate for the loss of such circuitry.

A PCM audio interface is still available in a standard 4-pin implementation for the integrated SIM variant GR64, using a Texas Instruments SSI implementation.

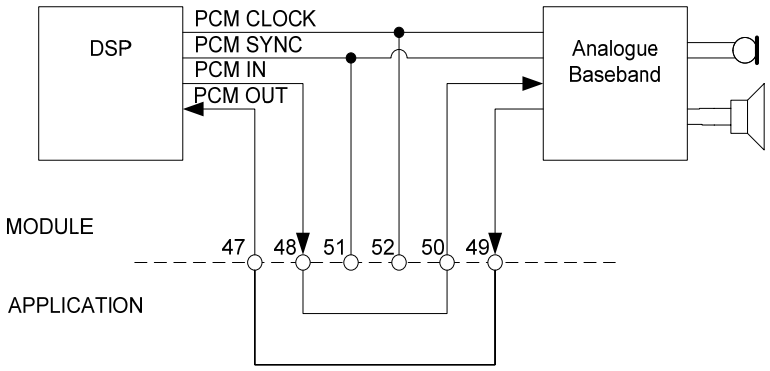


Fig A: GR4x implementation showing the PCM UL & DL paths wired together

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

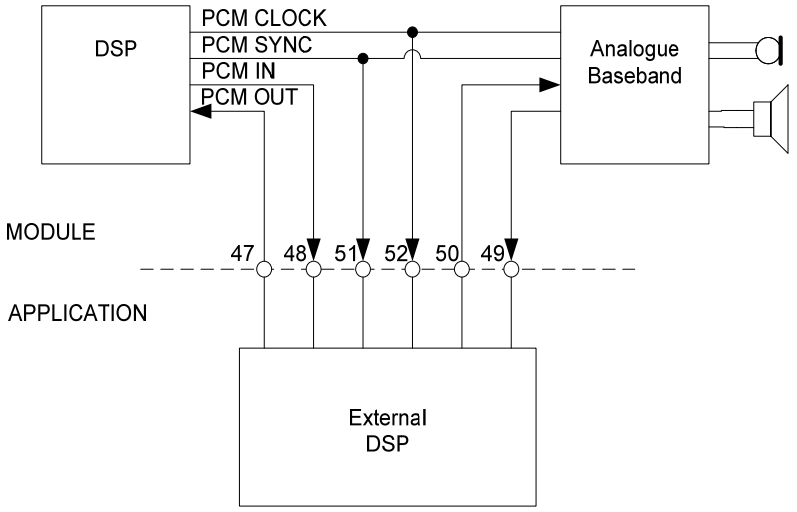


Fig B: GR4x implementation showing the PCM interfacing with an external DSP

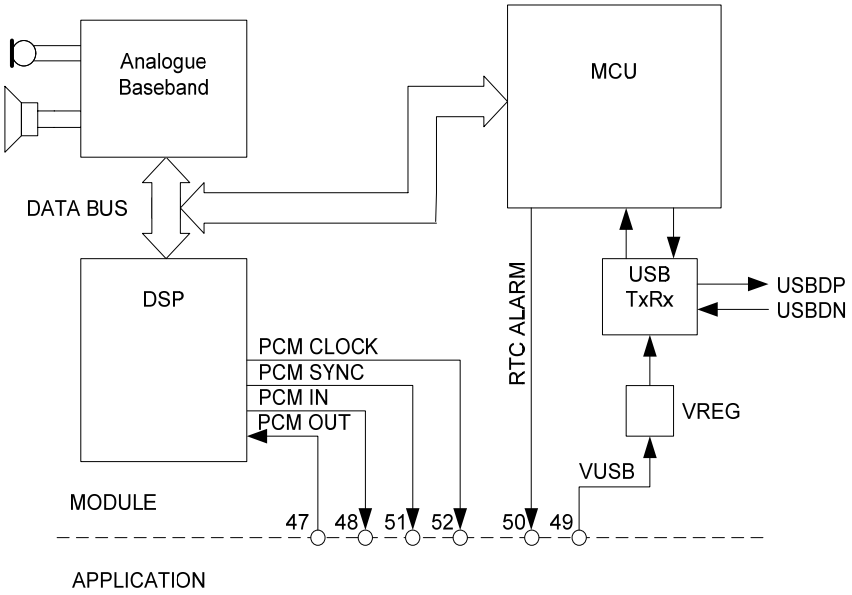


Fig C: GR64 integrated SIM variant showing new signal allocation

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

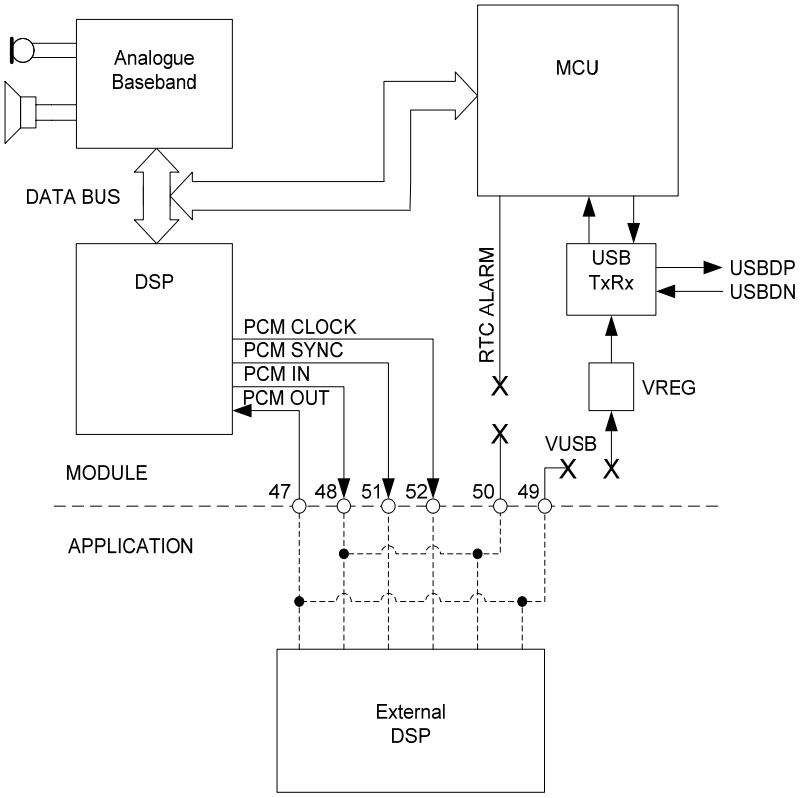


Fig D: GR64 Legacy variant showing removal of incompatible signal connectivity

Figures A through D illustrate the differences between signal implementation of the GR64 and predecessor products. Users with application circuits that physically connect the PCM signal between the CODEC and DSP of the GR4x series may use the GR64 legacy variant without risking damage to the host circuitry or the Wireless CPU®. In the legacy GR64 variant the links between pins 49 and 50 and their respective onboard circuits are disconnected by means of no-mounted jumpers on the Wireless CPU® itself.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

confidential ©

2.2.6 SIM Interface

The GR64 has support for 1.8V and 3.0V SIM cards, unlike the predecessor series which supported 3.0V and 5.0V SIMs.

The integrated SIM variant GR64 also has the capability to support more than one SIM. For this GR64 variant a secondary interface is available through the systems connector. SIM detection in each holder signals the presence of SIM cards to the GR64 which is able to selectively switch between SIMs.

Switching between Internal and External SIM holders is done by using the AT command AT*ESSE. The Wireless CPU will not switch active SIM automatically when a SIM card is removed or inserted, but it will detect the availability automatically.

2.2.7 DAC Interface

A hardware D to A converter was available to users in the GM/GR4x products. The GR64 does not possess a hardware DAC, instead a programmable PWM signal is available which can be used to create a DAC-like function on the host application.

2.2.8 ADC Interface

The A to D converter in the GR64 has a higher resolution (10-bit) compared with its predecessor device (8-bit), and a different input range.

2.2.9 SPI

The GR64 no longer supports SPI as predecessors like the GR47 did.

2.2.10 Sleep Mode

Sleep mode functionality differs between GR64 and its predecessor products. For the GR64, the customer must implement a mechanism to take advantage of the Sleep Mode low current mode, whereas doing so was not necessary for predecessors including the GR47.

For complete information regarding the Sleep Mode functionality of the GR64, please refer to the GR64 Application Note entitled “UART Sleep Protocols”, available for download on the Wavecom Web site.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

2.2.11 Mechanical Form Factor

The GR64 modem circuitry is significantly different to the predecessor device, being far more highly integrated. The result is that the wireless modem is fabricated on one side of the board. This single-sided arrangement results in a greatly reduced thickness and the ability to retain one side of the board unpopulated, except for the RF connector.

The GR64 mechanical outline remains the same as its predecessor devices. The system connector placement, RF connector positioning, and mounting hole locations are identical. The reduced thickness of the PCB (6-layer compared with the 10-layer predecessor) means that the RF connector centre-line is approximately 0.2mm lower. It is estimated that this will have no impact on existing applications, even those with integrated mechanical housing.

Mechanically, therefore, the GR64 is a true drop-in replacement for the GM/GR4x products. Comparative assemblies are shown in a subsequent section of this document.

2.3 General Observations

The fundamental difference in hardware and platform architecture between the GM/GR4x and the GR64 means that there are bound to be some incompatibilities. These have been minimized through deliberate and thoughtful replication of the legacy interfaces. Whilst every measure has been taken to create a functionally comparable product in GR64, there will be the inevitable fine tuning adjustment of applications to achieve a drop-in replacement. It has been the aim of Wavecom to limit any changes to minor ones which are easily and quickly achievable, such as component value changes.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

3 Product Comparison

This section compares the GR64 with its predecessor GR47/48 products, since these are the product that the GR64 was intended to most closely replicate. For all practical purposes the comparisons also reflect the similarities and differences to the GM47/48 since these products are merely a subset function of the GR products.

Comparison is made from an electrical signal, functional behavior, software and mechanical perspective. A signal interface table identifies the proposed pin out and signal assignment. A subsequent chapter reveals specific features of those signals which are different in the GR64 implementation, and also provides generalized information.

Mechanical drawings help the integrator to recognize differences in the basic profile of the products, the GR64's variant configurations, and inspect the mechanical mounting arrangement to confirm drop-in compatibility.

3.1 GR64 Signal Interface

Pin	Name	Direction	Function
1	VCC	Input	DC power
2	GND	-	Ground
3	VCC	Input	DC power
4	GND	-	Ground
5	VCC	Input	DC power
6	GND	-	Ground
7	VCC	Input	DC power
8	GND	-	Ground
9	VCC	Input	DC power
10	GND	-	Ground
11	CHG_IN	Input	Battery charger power
12	GND	-	Ground
13	ADIN4	Input	ADC Input 4
	GPIO5	In/Out	General purpose IO
14	ON/OFF	Input	Device on/off control
15	SIMVCC	Output	1.8V or 3.0V SIM card supply
16	SIMDET	Input	SIM presence detection
17	SIMRST	Output	SIM card reset signal
18	SIMDAT	In/Out	SIM card data

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

Pin	Name	Direction	Function
19	SIMCLK	Output	SIM card clock signal
20	DAC	Output	Pulse width modulated signal
21	GPIO1	In/Out	General purpose IO
22	GPIO2	In/Out	General purpose IO
23	GPIO3	In/Out	General purpose IO
24	GPIO4	In/Out	General purpose IO
25	VRTC	Input	DC supply for real time clock
26	ADIN1	Input	ADC Input 1
27	ADIN2	Input	ADC Input 2
28	ADIN3	Input	ADC Input 3
29	SDA	In/Out	I²C data (2.8V logic)
30	SCL	Output	I²C clock signal (2.8V logic)
31	BUZZER	Output	Buzzer Output
32	DSR1	Output	Data Set Ready (UART1)
	GPIO7	In/Out	General purpose IO
33	LED	Output	LED control signal
	GPIO6	In/Out	General purpose IO
34	VREF	Output	Core voltage reference
35	TX_ON	Output	Transmit indication
36	RI	Output	Ring Indicator
	GPIO8	In/Out	General purpose IO
37	DTR1	Input	Data Terminal Ready (UART1)
	GPIO10	In/Out	General purpose IO
38	DCD1	Output	Data Carrier Detect (UART1)
	GPIO11	In/Out	General purpose IO
39	RTS1	Input	Ready To Send (UART1)
	GPIO9	In/Out	General purpose IO
40	CTS1	Output	Clear To Send (UART1)
	GPIO12	In/Out	General purpose IO
41	DTM1	Input	Data To Module from host (UART1)
42	DFM1	Output	Data From Module to host (UART1)
43	DTM3	Input	Data To Module from host (UART3)
44	DFM3	Output	Data From Module to host (UART3)
45	Reserved	-	-
46	Reserved	-	-
47	SSPDTM	Input	Serial PCM data to module from host
48	SSPDFM	Output	Serial PCM data from module to host

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

Pin	Name	Direction	Function
49	Reserved	-	-
50	ALARM	Output	RTC alarm
51	SSPFS	In/Out	Serial PCM frame synchronization
52	SSPCLK	In/Out	Serial PCM clock
53	MICIP	Input	Microphone input positive
54	MICIN	Input	Microphone input negative
55	EARP	Output	Earpiece output positive
56	EARN	Output	Earpiece output negative
57	AUXO	Output	Auxiliary audio from module to host
58	SERVICE	Input	Flash programming enable signal
59	AUXI	Input	Auxiliary audio to module from host
60	AREF	-	Analogue reference

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

3.2 Specific Signal Differences

The major differences between GR64 and its predecessors were summarized in section 2. A further examination of the GR64 proposed signal interface in this section draws attention to specific interfaces which differ from its predecessors.

This document aims to give legacy users an insight in to the major differences. The detailed information for each interface, and its functional behaviour, is contained in the relevant Integrators Manual and supplementary Application Notes.

3.2.1 Signal Functionality

Signal functionality and accessibility differs between product variants. The legacy variant GR64 is designed to accommodate existing applications, but in doing so sacrifices some its predecessors capability because of the nature of the newer product platform (ASICs and software).

The following table identifies the differences, compared with the predecessor GM/GR 47/48 products, of the two major hardware variants of the GR64. The major effected signals are further described in the succeeded sections. For the fullest information on particular signal characteristics or their behaviour, integrators should refer to the Integrators Manual and supplementary Application Notes.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

Pin	Name	GR64 Legacy Variant	GR64 New Variant
1	VCC	No Change	No Change
2	GND		
3	VCC		
4	GND		
5	VCC		
6	GND		
7	VCC		
8	GND		
9	VCC		
10	GND		
11	CHG_IN	Higher Vmax, Lower current	Higher Vmax, Lower current
12	GND	No Change	No Change
13	ADIN4	ADC input range and bit resolution differs	ADC input range and bit resolution differs
	GPIO5		
14	ON/OFF	Similar in behaviour	Similar in behaviour
15	SIMVCC	1.8V & 3.0V only	1.8V & 3.0V only
16	SIMDET	No change	Internally & Externally supported SIMs
17	SIMRST	No change	
18	SIMDAT	No change	
19	SIMCLK	No change	
20	DAC	PWM output	PWM output
21	GPIO1	Input/Output impedance differs, due to level shifter interfaces	Logic levels are application-specific
22	GPIO2		
23	GPIO3		
24	GPIO4		
25	VRTC	Interface voltage is different	Interface voltage is different
26	ADIN1	ADC input range and bit resolution differs	ADC input range and bit resolution differs
27	ADIN2		
28	ADIN3		
29	SDA	No change	No change
30	SCL	No change	No change
31	BUZZER	Similar implementation	Similar implementation
32	DSR1	Input/Output impedance differs, due to level shifter interfaces	Logic levels are application-specific
	GPIO7		
33	LED		
	GPIO6		

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

Pin	Name	GR64 Legacy Variant	GR64 New Variant
34	VREF	No change	Becomes an input
35	TX_ON	Not available in R1	Not available in R1
36	RI / GPIO8	Input/Output impedance differs, due to level shifter interfaces	Logic levels are application-specific
37	DTR1 / GPIO10		
38	DCD1 / GPIO11		
39	RTS1 / GPIO9		
40	CTS1 / GPIO12		
41	DTM1		
42	DFM1		
43	DTM3		
44	DFM3		
45	Reserved	Not available in this variant	Reserved – replaces UART2 in legacy product
46	Reserved		
47	SSPDTM	New implementation – interfaces to DSP only	New implementation – interfaces to DSP only
48	SSPDFM		
49	Reserved	Not available	Reserved
50	ALARM	Not available	New to GR64
51	SSPFS	New implementation – interfaces to DSP only	New implementation – interfaces to DSP only
52	SSPCLK		
53	MICIP	Different audio signal levels	Different audio signal levels
54	MICIN		
55	EARP		
56	EARN		
57	AUXO		
58	SERVICE	Different implementation	Different implementation
59	AUXI	Different audio signal levels	Different audio signal levels
60	AREF	No change	No change

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

3.2.2 Charging Input

Pin	GR64	GR4x	Functional Difference
11	CHG_IN	CHG_IN	Input range, current limit, charge behavior

GR4x provisioned for a 5V, 600mA charging input. The GR64 has provisions for a 6.3V max, 500mA max charging source. The respective charging processes employ different mechanisms. For a full description of the CHG_IN, users should refer to a comprehensive description, and circuit implementation proposal in the GR64 Integrators Manual, available upon request from the Wavecom M2M Customer Support.

Change Impact: This change should have negligible impact on existing integrators.

3.2.3 SIM voltage

Pin	GR64	GR4x	Functional Difference
15	SIMVCC	SIMVCC	Support for SIM technology

The GR64 supports only 1.8V and 3.0V SIM cards. It does not provide support for the 5.0V SIM cards, which became obsolete some years ago.

Change Impact: This change will not impact existing integrators.

3.2.4 D to A Converter

Pin	GR64	GR4x	Functional Difference
20	DAC	DAC	Software vs Hardware implementation

The signal from the GR64 to the DAC output is a programmable Pulse Width Modulated (PWM) signal. Although this is not a hardware DAC like the predecessor interface (which produced a true analogue voltage output) it can be easily adapted with simple analogue filter circuitry to emulate a DAC function. An example can be found in the GR64 Integrators Manual, available upon request from the Wavecom M2M Customer Support.

Change Impact: This will require some programming and a simple circuit implementation on the host application.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

3.2.5 Real Time Clock Voltage

Pin	GR64	GR4x	Functional Difference
25	VRTC	VRTC	Voltage range

The GR4x and GR64 Real Time Clock (RTC) can be powered by a backup device when the Wireless CPU®s are not powered. When the Wireless CPU® is powered the backup component (a battery cell or capacitor) can be re-charged. The mechanics of VRTC is similar for both devices, but the charging voltage and the backup voltage discharge limit is marginally different, with the GR64 being a narrower guaranteed range.

Change Impact: In most applications, which require backup periods less than a few weeks, this will not present a problem.

3.2.6 A to D Converter

Pin	GR64	GR4x	Functional Difference
22	GPIO2	ADC5*	Does not exist in GR64
13	ADIN4	ADC4	Input resolution & range
26	ADIN1	ADC1	
27	ADIN2	ADC2	
28	ADIN3	ADC3	

The GR64 has a 10-bit ADC, compared with its predecessor product which only offered 8-bit resolution. The input voltage range is slightly narrow in the GR64.

Change Impact: Some additional calibration to adjust the A to D conversion scaling is all that will be required.

3.2.7 Regulated Voltage Reference

Pin	GR64	GR4x	Functional Difference
34	VREF	VIO	Integrated level shifters now provided

The GR4x series provided VIO as an indication of power-on to the host, and as a current limited supply for external applications, mostly to be used as a reference for level shifters.

The Legacy variant GR64 provides similar functionality, except its use as a level-shifter reference voltage is superseded in the most part by the inclusion of integrated level shifters in the modem. The VREF output is 2.8V. This 2.8V output becomes high impedance at power down compared to grounded in GR4x series.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

For the new variant GR64, the VREF pin is configured as an input. In this arrangement he user provides a reference voltage from their own application, which is used by the host-side level shifter interfaces.

Change Impact: No impact to existing users for the legacy variant.

3.2.8 Former UART2

Pin	GR64	GR4x	Functional Difference
45	Reserved	TD2	UART2 replaced by reserved interface
46	Reserved	RD2	

One of the three UARTs in the GR4x series has been replaced by a reserved interface in the GR64. The absence of a third hardware UART encouraged this change.

Change Impact: For users of the third UART in GR4x products, some re-configuration of serial interfaces may be necessary. Different alternatives are available; an Embedded Application for configuring GPIO like an SPI bus offers a viable serial interface.

3.2.9 Former PCM Audio Digital CODEC Interface

Pin	GR64	GR4x	Functional Difference
47	VUSB	PCMULD	PCM CODEC interface does not exist

A PCM interface between the GR4x series audio CODEC and the DSP gave users the option of installing a DSP device to improve audio acoustic performance. The GR64 voice-band architecture is more advanced and far better performing than its predecessor. This factor, together with the GR64 memory-mapped digital audio removes the need for this former interface.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

3.2.10 ALARM

Pin	GR64	GR4x	Functional Difference
48	ALARM	PCMDLD	PCM CODEC interface does not exist

The former PCMDLD pin is utilized as an RTC alarm output. This feature is new to GR64. It provides a feature for users to be able to set an alarm based on a RTC setting. If an RTC backup source is attached to VRTC, this function will allow the Wireless CPU® to wake a host application even though the Wireless CPU® itself is completely powered down.

Change Impact: For users who had DSP devices hooked to this interface, the removal of this circuitry will reduce cost in their product. The audio performance of GR64 overcomes the shortcomings of the predecessor products. Removal of the need for a PCM CODEC interface is considered to be an enhancement. The addition of a RTC Alarm is also viewed as an enhancement.

3.2.11 SERVICE signal

Pin	GR64	GR4x	Functional Difference
58	SERVICE	SERVICE	Different voltage, different behavior

The traditional role of the Service function in GR4x-generation devices was that of a flashing (programming) accelerator, where voltages as great as 12V were applied to the interface. The memory technology used in GR64 does not require a higher voltage than the standard digital interface level (2.8V) and will suffer damage if excessive voltage is applied. To overcome the risk of damage to the Wireless CPU®, over-voltage protection on the service pin has been implemented.

The Service interface for GR64 is implemented as a simple logic input and should be exercised in accordance with the signal levels defined in the GR64 Integrators Manual.

Change Impact: Changes in the flash memory programming procedure have no detrimental impact on existing product users. The only impact is that users will have to adopt a new procedure, which is designed to make the programming process easier.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

3.3 General Signal Differences

3.3.1 Audio Interfaces

The behavior of the audio interfaces from an electrical signal perspective is similar in the GR64 to that of the GR4x series devices.

It is anticipated that there will be minimal or no change to existing application circuitry for the analogue audio sections. Certainly, it should be possible to achieve reasonable audio quality by maintaining the same interface components. Some inevitable fine tuning of audio profiles may be necessary.

The GR64 analogue audio input levels are different to the predecessor products, as are the internal link gains, plus the GR64 has dynamic AGC on the downlink which further improves performance. To optimize analogue audio interface performance users may, at their discretion, adjust input gain scaling and output component values. It is recommended that users test their existing implementation to assess whether this is necessary.

The PCM (digital) audio interface in the GR64 is pin compatible with the predecessor products for a standard 4-wire synchronous serial interface:

- PCM data from Wireless CPU® to host
- PCM data from host to Wireless CPU®
- PCM Frame Sync
- PCM Clock

The GR64 PCM interface will function in the same sampling manner as the GR4x products, which uses a 16-bit frame size, 13-bit word, sampled at 8ksps. The GR64 PCM interface functions in a master only mode.

The GR64 PCM word format for regular GSM voice communications is LSB justified, unlike the predecessor products which were offset. Some minor adjustment in existing user application may be necessary to perform bit re-alignment to cater for this difference.

Details of the audio electrical interfaces and PCM frame structure can be found in the GR64 Integrators Manual available upon request from the Wavecom M2M Customer Support.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

3.3.2 Multiplexed Signal Functions

The GR4x series multiplexes a number of signals to provide additional feature support. Many of these multiplexed functions provide optional GPIO where, for example, RS232 handshaking signals are not required in the customers control interface. The capability to use GPIO in preference to the control signals is also available in GR64. The only difference is that the user needs to select to either use the pins as RS232 handshaking, or as GPIOs.

The other primary multiplexed interface in GR4x is the Keyboard function. This too is available in GR64 but the mapping is different because of architectural constraints. An application note details the method of defining digital GPIO as keyboard interfaces, offering various keyboard matrix sizes.

Developers that presently use the keyboard feature may need to re-map their existing interface pins to keypad columns and rows. Please note that the keypad support is not provided in the GR64 as it was in previous releases. It is still possible to implement keypad functionality using the available I/O pins. Support services for this are available upon request.

Details of the multiplexed pin functions can be found in the GR64 Integrators Manual available upon request from the Wavecom M2M Customer Support.

3.4 Software Compatibility

Legacy users will benefit from having a GR64 product which has been developed to maintain the largest extent of functional compatibility possible with existing GR/GM4x products, as well as some advanced features and performance enhancements.

It has been a Wavecom M2M primary goal to make the GR64 similar enough to its predecessor products such that minimal software effort will be required in order to achieve the same functions and performance when substituted in the user's existing application.

Some change is inevitable because of core architecture difference. These changes, and the way in which they impact legacy customers, have been minimized by frequent reference to the control, response, and behavior of the products that the GR64 is replacing.

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

3.4.1 Signal Behaviour

The LED interface (pin 33) power mode and network connection status indication properties may differ to some degree from GR4x. The programming of this interface will emulate, as close as possible, the existing indication.

3.4.2 AT Commands

The AT command set for the GR64 is similar to that of legacy products. Some additions have been made to the overall command set. Changes and enhancements have been made to some legacy AT commands which may result in slightly modified behavior, or involve a different number or range of associated parameters.

The most commonly used legacy AT commands are provided in the table below, which identifies difference that exist between the GR47/48 implementation and that of the GR64. The table just provides summary information. Users are encouraged to refer to the GR64 AT command manual for a comprehensive guide to command parameters, usage and examples.

NOTE: The following table presents the most commonly used AT Commands and is not a complete list. For an exhaustive list of all AT Commands available for the GR64 and their details, please refer to the latest AT Command Manual, available for download on the Wavecom Web site.

AT Command	Function	Differences in GR64 compared with GR47/48
ATD	Dial	Additional characters added for <dial_string>: *"A B C"* Additional GSM Modifiers: *W, ",", T and P*
ATH	Hang up	Same as GR47/GR48 command
AT+CSNS	Single Numbering Scheme	Same as GR47/GR48 command (R7 firmware onwards)
AT+CALA	Set Alarm	Same as GR47/GR48 command
AT+CFUN	Set Phone Functionality	Addition of reset <rst> parameter and response
AT+CPIN	PIN Control	New values for <pin>, <code>, and <err>
AT+CSQ	Signal Strength	Same as GR47/GR48 command
AT*E2RESET	Restart Wireless CPU®	Same as GR47/GR48 command
AT*ECAM	Call Monitoring	Same as GR47/GR48 command
AT*E2APR	Audio Profile Management	<param1>, <param2> changed

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

AT Command	Function	Differences in GR64 compared with GR47/48
		from: 0,1,2 to: 0,1,2,3 to match audio profile parameter <op>
AT*E2EAMS	Audio Profile Modification	Some legacy <op> parameters are not supported because of the fundamental difference in audio path architecture
AT+CBST	Select Bearer Service Type	Same as GR47/GR48 command
AT+CGDCONT	Define PDP Context	<cid> values changed from: 1-10 to: 1-20 new =? query responses provided for: <d-comp> data compression; <h-comp> header compression
AT+CGREG	GPRS Network Registration Status	Same as GR47/GR48 command
AT*E2IPA	IP Activate	<cid> added as response to AT*E2IPA? Value range of <cid> changed from: 0-10 to: 0-19 for a reference to a PDP context identifier previously defined with AT+CGDCONT
AT*E2IPC	IP Socket Close	<SockId> optional parameter added
AT*E2IPO	IP Open/Connect	<SockId> optional parameter added
AT*E2IPI	IP Info	Same as GR47/GR48 command
AT*E2IPE	IP Error	<SockId> added as parameter [= Error] response removed Intermediate result codes added for: <ErrNum> 0-18
AT*E2IPL	IP listen (server)	Same as GR47/GR48 command
AT*E2IPRH	IP Resolve Host	Same as GR47/GR48 command
AT*E2IPS	IP Setup IP Parameters	Same as GR47/GR48 command
AT*ENAD	Internet Account Define	Same as GR47/GR48 command
AT+CGMR	Read Revision Identification	<Revision> parameter changed from: a string containing date (year, month, day, hour, minute) plus KRC number to: a string containing the SW product number (CXC number) and software revision
ATI	Identification Information	Following <value> options deleted:

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable
wavecom confidential ©

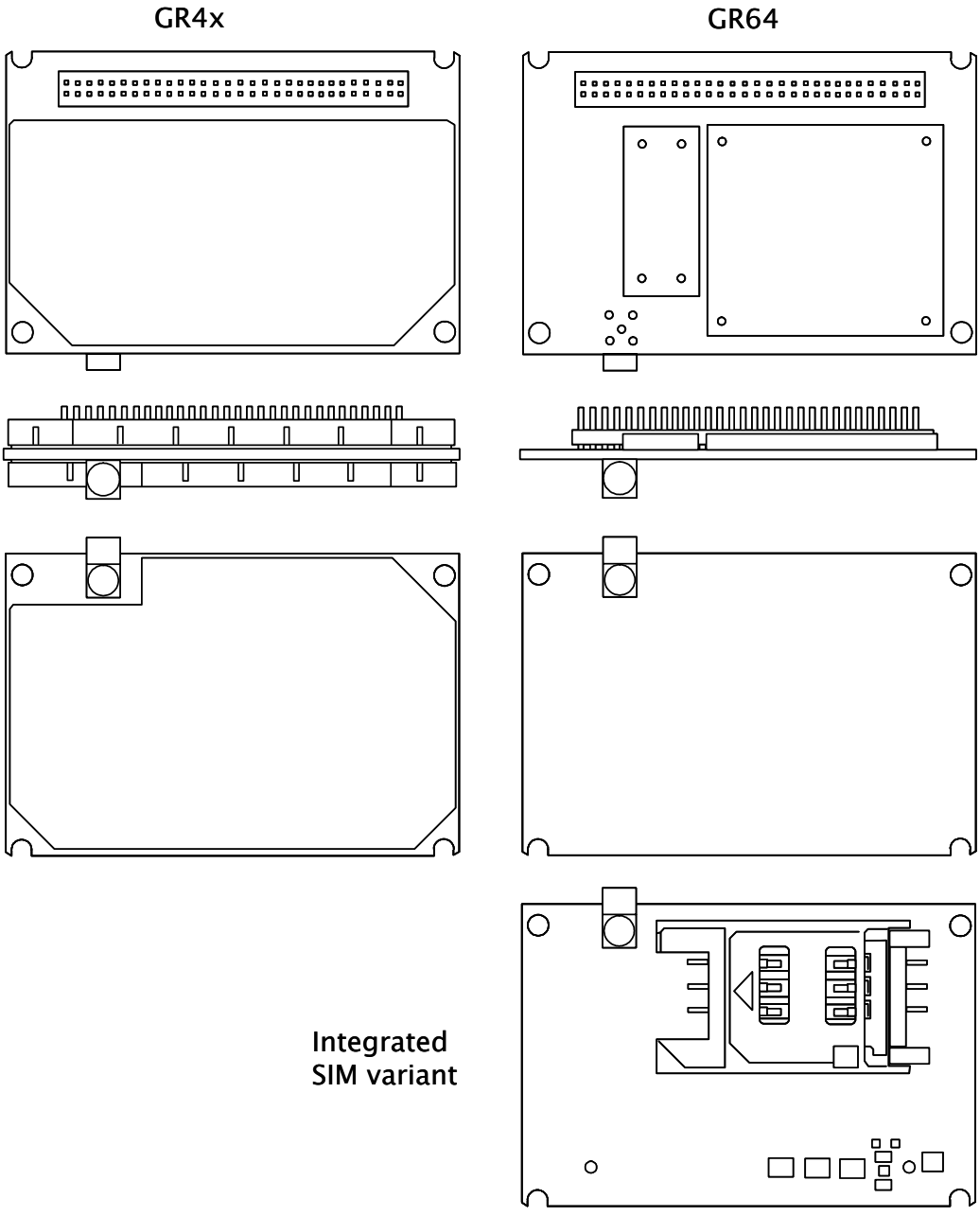
AT Command	Function	Differences in GR64 compared with GR47/48
		5 – Active settings 7 – Modem configuration profile 9 – PnP information
AT*E2EMM	Engineering Monitoring Mode	Same as GR47/GR48 command
AT*E2SSN	SIM Serial Number	Same as GR47/GR48 command
AT+COPS	Operator Selection	Same as GR47/GR48 command
AT*E2SMSRI	Ring indicator for SMS	Same as GR47/GR48 command
AT+CMGF	Message Format	Same as GR47/GR48 command
AT+CMGS	Send Message	Same as GR47/GR48 command
AT+CMGD	Delete Message	Same as GR47/GR48 command
AT+CMGL	List Message	Same as GR47/GR48 command
AT+CMGR	Read Message	Same as GR47/GR48 command
AT+CNMI	New Message Indications	<bfr> added as a new parameter as follows: Buffered unsolicited reports defined within this command are cleared when <mode> 1...2 is entered. <mode> value changed from: value 3 to: values 0,1,2
AT+CPMS	Preferred Message Storage	Same as GR47/GR48 command
AT+CSCS	Select Character Set	Same as GR47/GR48 command
AT+CSMP	Set Text Mode Parameters	Same as GR47/GR48 command
AT+CSCB	Select Cell Broadcast Message Type	Same as GR47/GR48 command

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

4 Mechanical Comparisons

The GR4x and GR64 products are shown as mechanical views below. Clearly, the mechanical mounting arrangements are the same. In this respect the mechanical form and fit are identical. The differences are equally obvious. The GR64 modem circuit is contained on one side of the PCB assembly, allowing for two variants; one with nothing on the reverse side, other than the RF connector; another with an integrated SIM holder.



This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©

WARNING

Take care in handling the GR64 Wireless CPU® due to the presence of fragile components in the RF Connector side of the assembly, as highlighted in the figure below. Be sure that these components make no contact to any hard surface during the storage, test, assembly, packaging, shipment, or life-use of the GR64 Wireless CPU®. Making contact between the components and hard surfaces, or otherwise mishandling the GR64 Wireless CPU®, can result in malfunction or breakage.

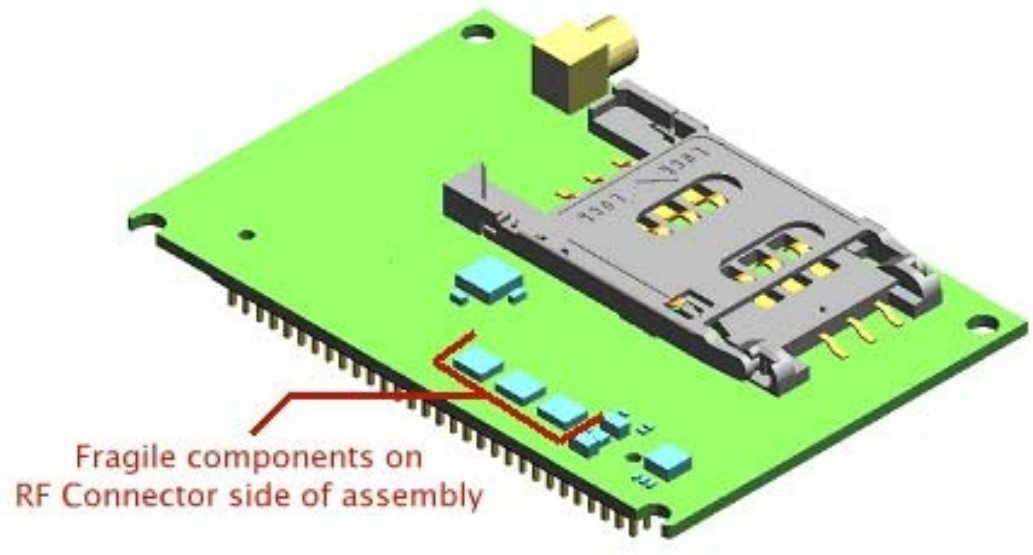
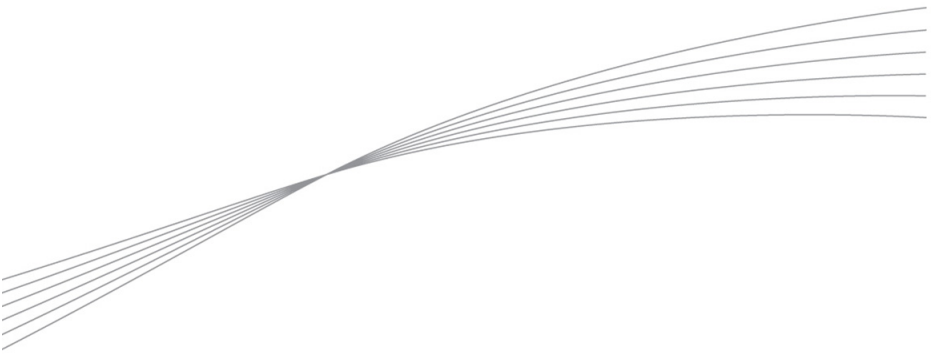


Fig E: Fragile components to be wary of on GR64 Wireless CPU®

This document is the sole and exclusive property of WAVECOM. Not to be distributed or divulged without prior written agreement.
Ce document est la propriété exclusive de WAVECOM. Il ne peut être communiqué ou divulgué à des tiers sans son autorisation préalable

wavecom confidential ©



wavecom

Make it wireless

WAVECOM S.A. - 3 esplanade du Foncet - 92442 Issy-les-Moulineaux Cedex - France - Tel: +33(0)1 46 29 08 00 - Fax: +33(0)1 46 29 08 08
Wavecom, Inc. - 430 Davis Dr. Suite 300 - Research Triangle Park, NC 27709 - USA - Tel: +1 919 237 4000 - Fax: +1 919 237 4140
WAVECOM Asia Pacific Ltd. - Unit 201-207, 2nd Floor - Bio-Informatics Centre - No. 2 Science Park West Avenue - Hong Kong Science Park, Shatin - New Territories, Hong Kong - Tel: +852 2824 0254 - Fax: +852 2824 0255